

CLAIMS

What is claimed:

1. A radiation process, comprising:
 - illuminating an object with a first beam at a first energy
 - 5 level;
 - determining a first image of the object formed by the first beam;
 - determining configuration data using the first image;
 - illuminating the object with a second beam at a second
 - 10 energy level;
 - determining a second image of the object formed by the second beam;
 - determining radiation absorption data using the second image; and
 - 15 determining a radiation treatment plan using the configuration data and the radiation absorption data.
2. The method of claim 1, wherein the first energy level is a keV energy level, and the second energy level is a MeV energy
- 20 level.
3. The method of claim 1, wherein the first beam and the second beam have low intensities.
- 25 4. The method of claim 1, wherein the first beam has an intensity between approximately 1 Rad and 20 Rad, and the second beam has an intensity between approximately 250 Rad and 1000 Rad.

5. The method of claim 1, wherein the second beam has a constant intensity during a session.

5 6. The method of claim 1, further comprising adjusting an intensity of the second beam during a session.

7. The method of claim 1, wherein the illuminating the object with the first beam and the illuminating the object with the
10 second beam are performed in alternating pulses.

8. The method of claim 1, wherein the illuminating the object with the first beam and the illuminating the object with the second beam are performed sequentially.

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9. The method of claim 1, wherein the determining configuration data comprises comparing data associated with the first image with data regarding configuration of the object specified in a treatment prescription.

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10. The method of claim 1, wherein the determining radiation absorption data comprises calculating a radiation absorption rate in the object.

25 11. The method of claim 1, further comprising storing the configuration data and the radiation absorption data in a computer readable medium.

12. The method of claim 1, wherein the configuration data comprises one or a combination of location, size, and shape of the object.

5 13. The method of claim 1, wherein the radiation treatment plan is configured for use in a computed cone therapy.

14. A radiation system, comprising:

means for generating a first beam at a first energy level
10 for illuminating an object;

means for determining a first image of the object formed by the first beam;

means for determining configuration data using the first image;

15 means for generating a second beam at a second energy level for illuminating the object;

means for determining a second image of the object formed by the second beam;

20 means for determining radiation absorption data using the second image; and

means for determining a radiation treatment plan using the configuration data and the radiation absorption data.

15. The system of claim 14, wherein the means for determining
25 configuration data comprises means for comparing data associated with the first image with data regarding configuration of the object specified in a treatment prescription.

16. The system of claim 14, wherein the means for determining radiation absorption data comprises means for calculating a radiation absorption rate in the object.

5 17. The system of claim 14, further comprising means for storing the configuration data and the radiation absorption data.

18. A radiation process, comprising:

10 illuminating an object with a beam at a MeV energy level;
determining an image of the object formed by the beam;
determining configuration data and radiation absorption data using the image; and

determining a radiation treatment plan based on the
15 configuration data and the radiation absorption data.

19. The method of claim 18, wherein the beam has a constant intensity during a session.

20 20. The method of claim 18, further comprising adjusting an intensity of the beam during a session.

21. The method of claim 18, wherein the determining configuration data comprises comparing data associated with
25 the image with data regarding configuration of the object specified in a treatment prescription.

22. The method of claim 18, wherein the determining radiation absorption data comprises calculating a radiation absorption
30 rate in the object.

23. The method of claim 18, further comprising storing the configuration data and the radiation absorption data in a computer readable medium.

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24. The method of claim 18, wherein the configuration data comprises one or a combination of location, size, and shape of the object.

10 25. The method of claim 18, wherein the radiation treatment plan is configured for use in a computed cone therapy.

26. A radiation system, comprising:

15 means for generating a beam at a MeV energy level for illuminating an object;

means for determining an image of the object formed by the beam;

means for determining configuration data and radiation absorption data using the image; and

20 means for determining a radiation treatment plan using the configuration data and the radiation absorption data.

27. The system of claim 26, further comprising means for adjusting an intensity of the beam during a session.

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28. The system of claim 26, wherein the means for determining configuration data comprises means for comparing data associated with the image with data regarding configuration of the object specified in a treatment prescription.

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29. The system of claim 26, wherein the means for determining radiation absorption data comprises means for calculating a radiation absorption rate in the object.

5 30. The system of claim 26, further comprising means for storing the configuration data and the radiation absorption data.

31. A radiation process, comprising:

10 illuminating an object with a treatment beam in accordance with a treatment plan;

determining an image of the object formed by the treatment beam;

15 determining radiation absorption data using the image; and evaluating an execution of the treatment plan based on the radiation absorption data.

32. The process of claim 31, further comprising adjusting the treatment beam.

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33. The process of claim 32, wherein the adjusting comprises one or a combination of changing a direction, a shape, and an intensity of the treatment beam.

25 34. The process of claim 31, further comprising determining configuration data for the object.

35. The process of claim 34, wherein the determining the configuration data comprises

30 illuminating the object with an image beam;

determining an image formed by the image beam; and
determining the configuration data using the image formed
by the image beam.

5 36. The method of claim 34, wherein the evaluating is
performed based on the configuration data.

37. The method of claim 34, further comprising adjusting the
treatment beam based on the configuration data.

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38. The method of claim 34, further comprising gating an
operation of the treatment beam based on the configuration
data.

15 39. The process of claim 31, further comprising verifying the
treatment plan before illuminating the object with the
treatment beam.

20 40. The process of claim 31, further comprising developing the
treatment plan.

41. The process of claim 40, wherein the developing the
treatment plan and illuminating an object with a treatment
beam are performed during a single patient session.

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42. A radiation system, comprising:

means for generating a treatment beam for illuminating an
object in accordance with a treatment plan;

30 means for determining an image of the object formed by the
treatment beam;

means for determining radiation absorption data using the image; and

means for evaluating an execution of the treatment plan based on the radiation absorption data.

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43. The system of claim 42, further comprising means for determining configuration data for the object.

44. The system of claim 43, further comprising means for
10 gating an operation of the treatment beam based on the configuration data.

45. An apparatus for irradiating an object, comprising:
a platform for supporting an object;

15 a first beam source configured to generate a first radiation beam at a first intensity level and a second radiation beam at a second intensity level toward the platform;

a beam adjuster in front of the first beam source;

20 a projection detector configured to generate a first image of the object illuminated by the first radiation beam at the first intensity level; and

a control module coupled to the projection detector and to the beam adjuster.

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46. The apparatus of claim 45, further comprising a second beam source configured to generate an image beam toward the platform, wherein the projection detector is further configured to generate a second image of the object
30 illuminated by the image beam.

47. The apparatus of claim 45, wherein the control module is configured to develop a radiation treatment plan based on the first image.

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48. The apparatus of claim 46, wherein the control module is configured to develop a radiation treatment plan based on one or both of the first image and the second image.

10 49. The apparatus of claim 45, wherein the control module is configured to adjust one or a combination of a shape, an intensity, and a direction of the second radiation beam.

50. An apparatus for irradiating an object, comprising:
15 a platform for supporting an object;
 a first beam source configured to generate a first radiation beam at a first intensity level and a second radiation beam at a second intensity level toward the platform;
20 a second beam source configured to generate an image beam toward the platform;
 a beam adjuster in front of the first beam source;
 a projection detector configured to generate one or both of a first image of the object illuminated by the first
25 radiation beam at the first intensity level and a second image of the object illuminated by the image beam; and
 a control module coupled to the projection detector and to the beam adjuster.

51. The apparatus of claim 50, wherein the control module is configured to determine a treatment plan based on one or both of the first and second images.

5 52. The apparatus of claim 50, wherein the control module is configured to verify a treatment plan based on one or both of the first and second images.

10 53. The apparatus of claim 50, wherein the control module is configured to modify a treatment plan based on one or both of the first and second images.

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